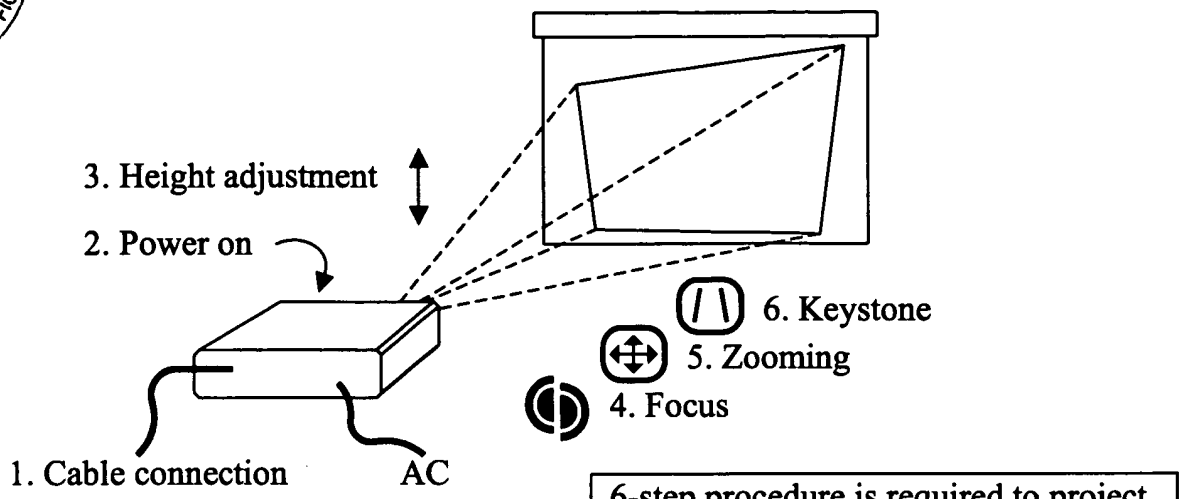
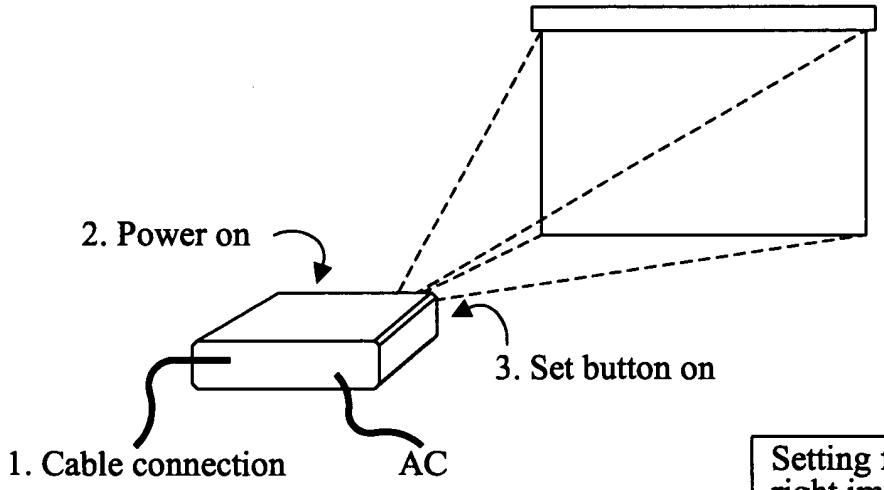


6-step procedure is required to project an image in the right way.
(Steps 3-6 are repeated to make right adjustment by confirming the results of adjustment each time)

FIG. 1 (PRIOR ART)



Setting free model enables right image projection by just pressing the power switch and set button.

FIG. 2

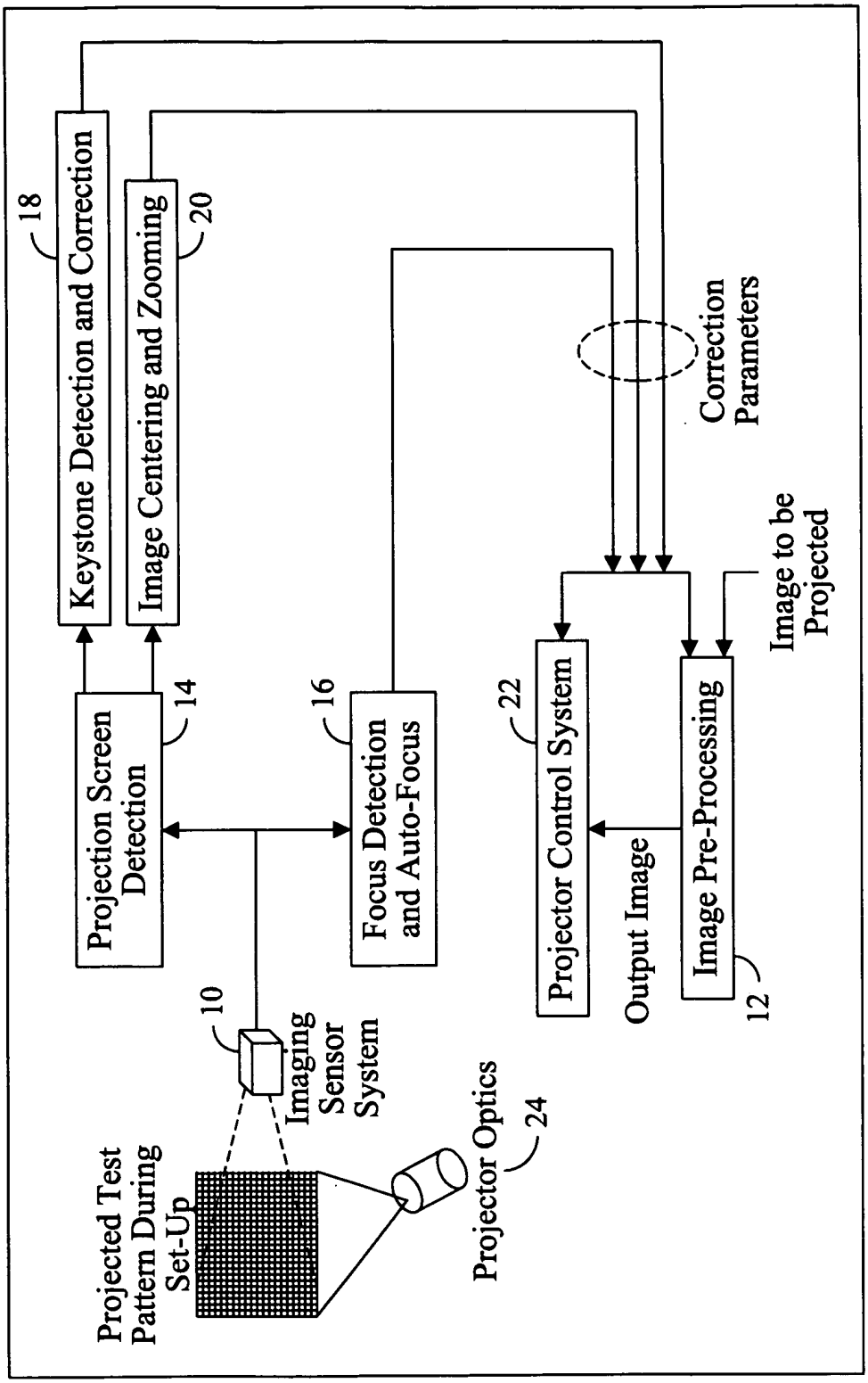

Keystone Detection and Correction
18
Image Centering and Zooming
20
Correction Parameters
Image to be Projected
Projection Screen Detection
14
Focus Detection and Auto-Focus
16
Projector Control System
22
Output Image
Image Pre-Processing
12
10
Imaging Sensor System
Projected Test Pattern During Set-Up
Projector Optics
24

FIG. 3

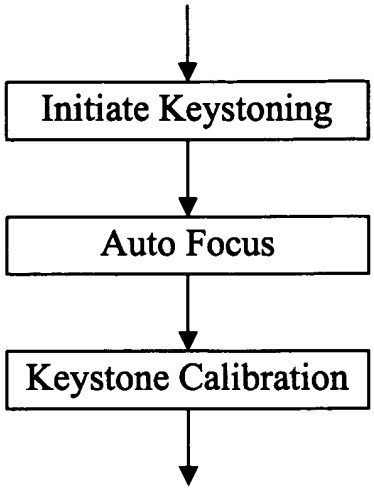


FIG. 4

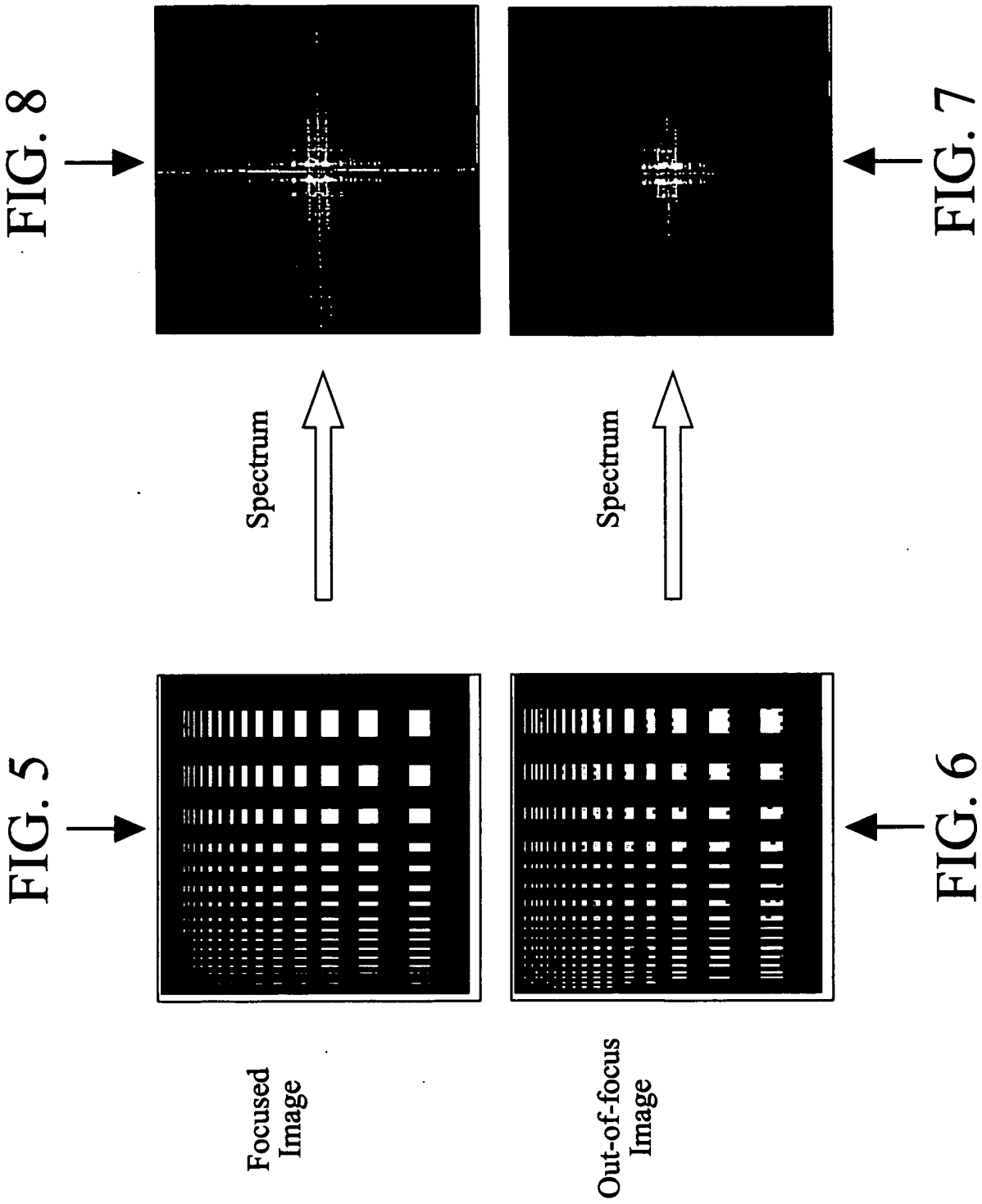


FIG. 8
FIG. 7
Spectrum
Spectrum
FIG. 5
FIG. 6
Focused Image
Out-of-focus Image

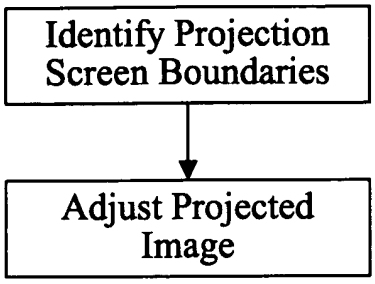

Identify Projection Screen Boundaries
Adjust Projected Image

FIG. 9

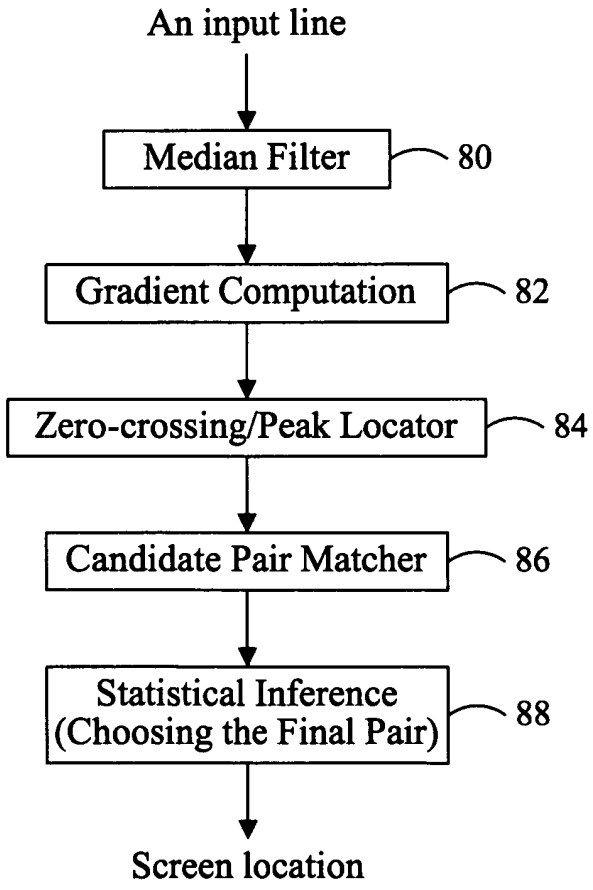
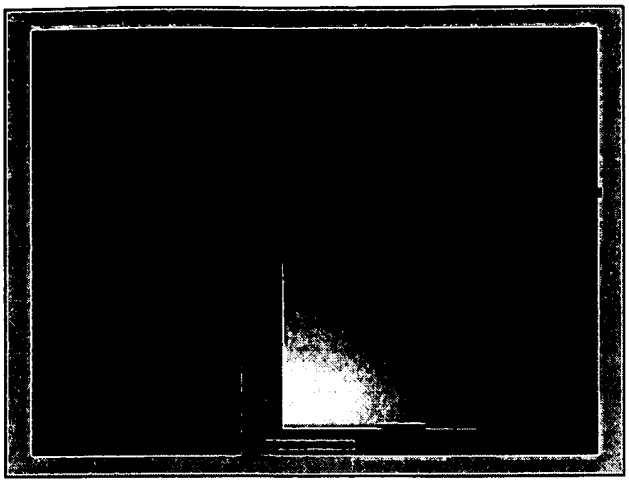

An input line
Median Filter
80
Gradient Computation
82
Zero-crossing/Peak Locator
84
Candidate Pair Matcher
86
Statistical Inference (Choosing the Final Pair)
88
Screen location

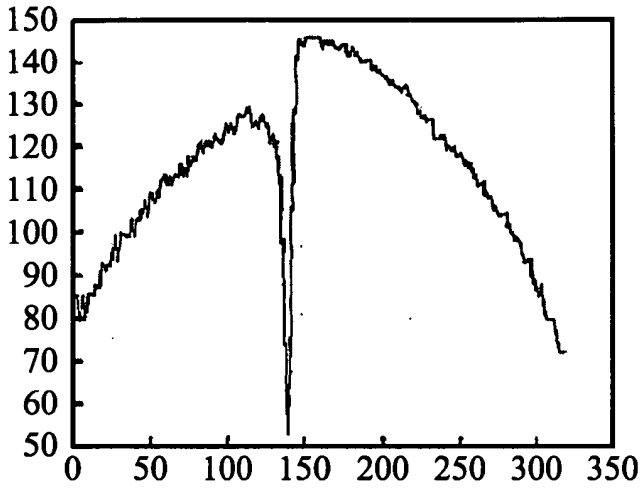
FIG. 10

(b)



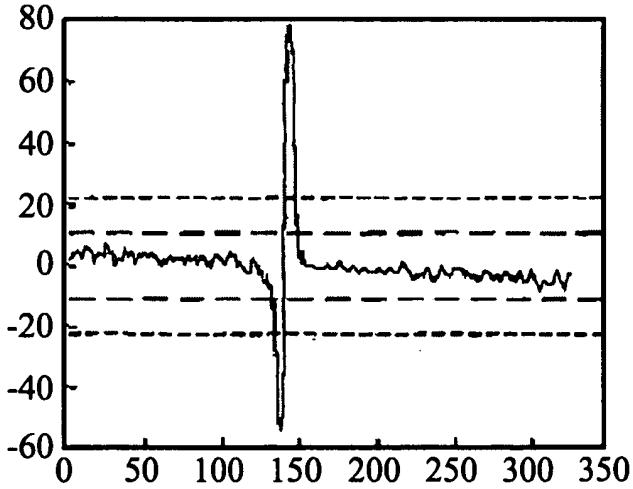
An image of the screen from the projector's perspective. The line is assumed to be the one row that the 1-D sensor can sense.

(b)



The luminance values of the row in (a), illustrating that working in the luminance domain there may be no region that is uniform (and thus is potential screen area).

(c)



The gradient of (b).

FIG. 11

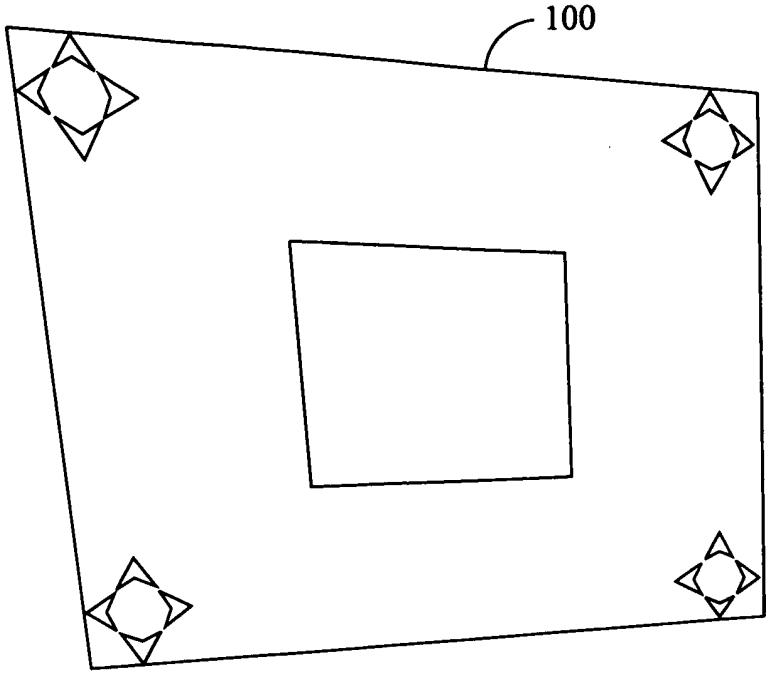


FIG. 12

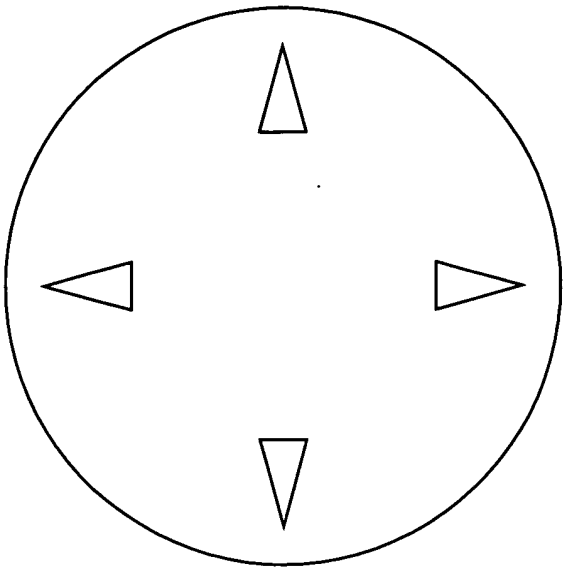
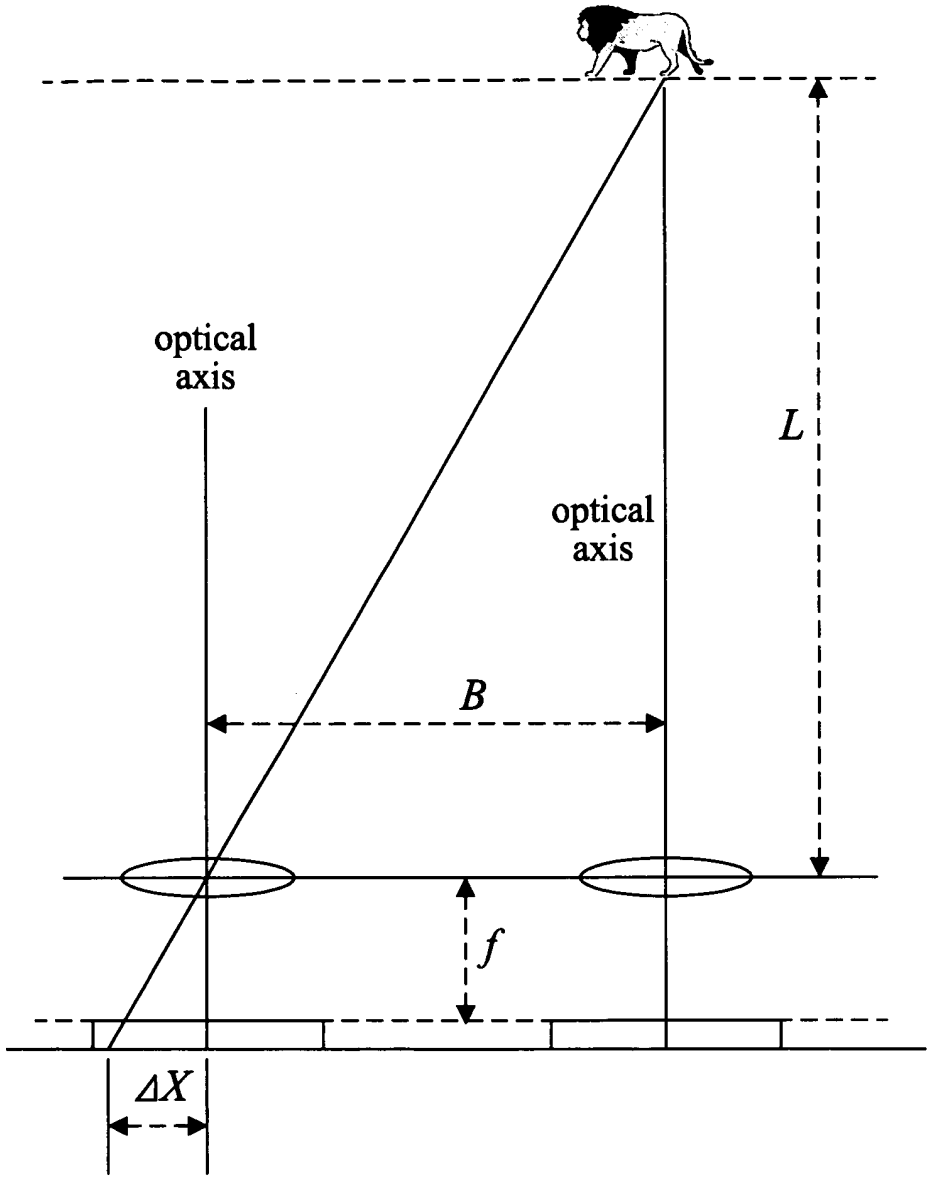


FIG. 13



Based on the similarity of the triangles, the distance L is computed as a function of the sensor parameters (B and f) and the disparity ΔX (difference between the two images of the same physical point):

$$L = \frac{Bf}{\Delta X}$$

FIG. 14

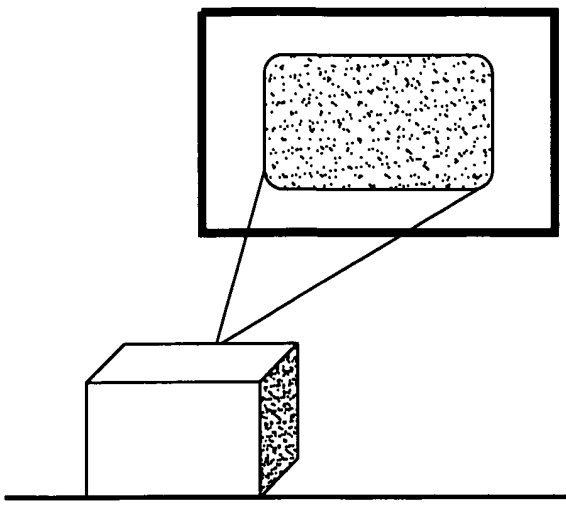


FIG. 16

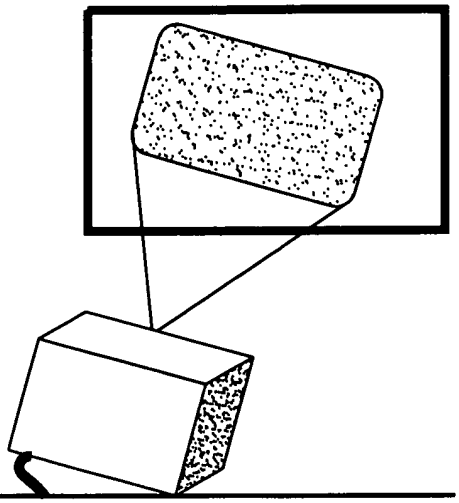


FIG. 15

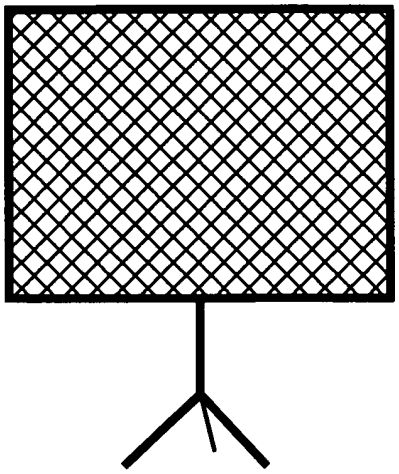


FIG. 17A

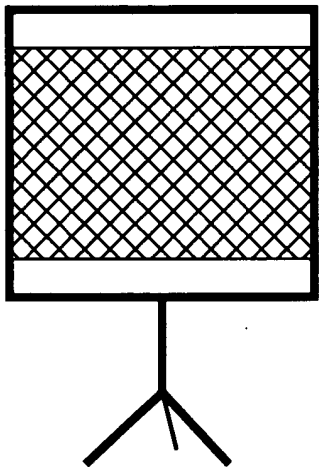


FIG. 17B

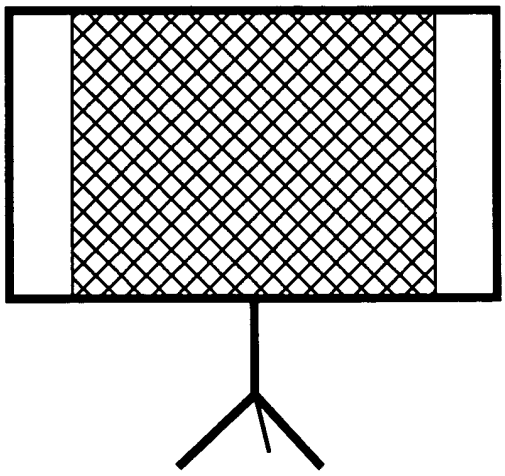


FIG. 17C

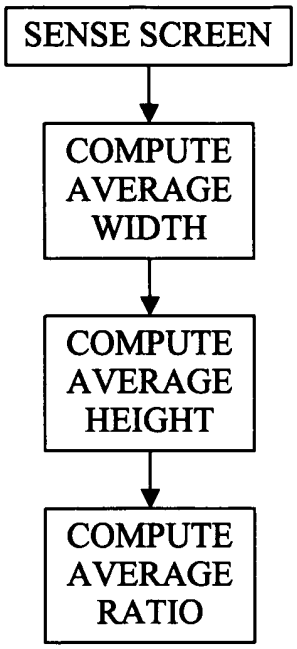


FIG. 18

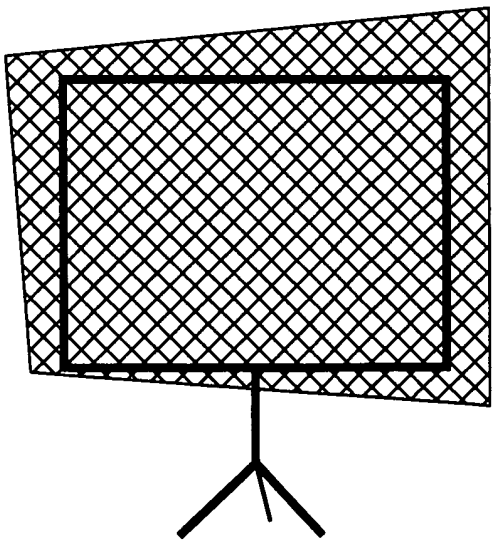


FIG. 19

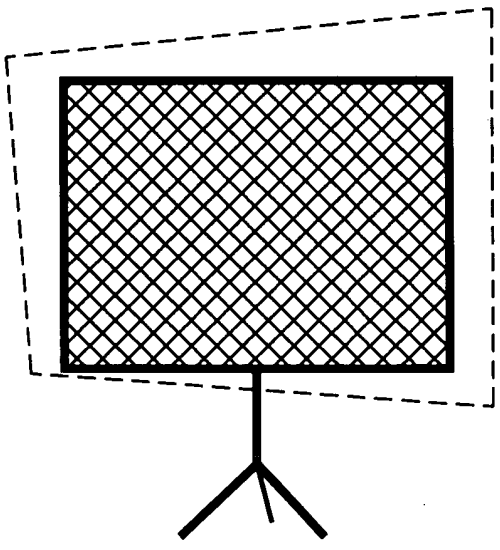


FIG. 20

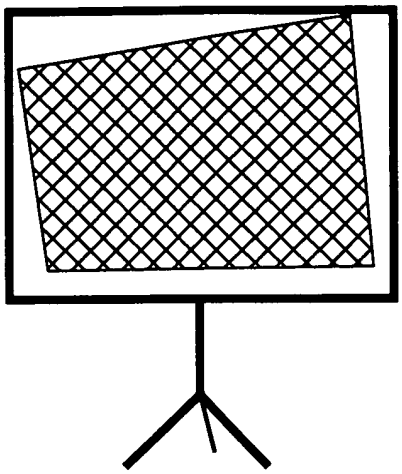


FIG. 21

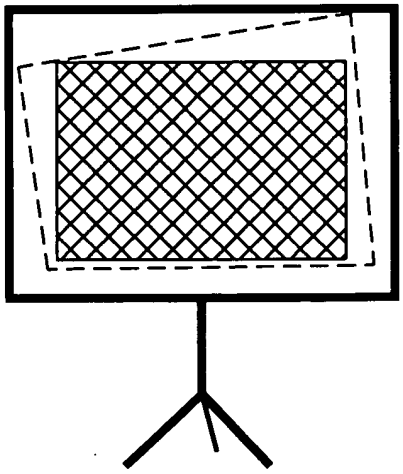


FIG. 22

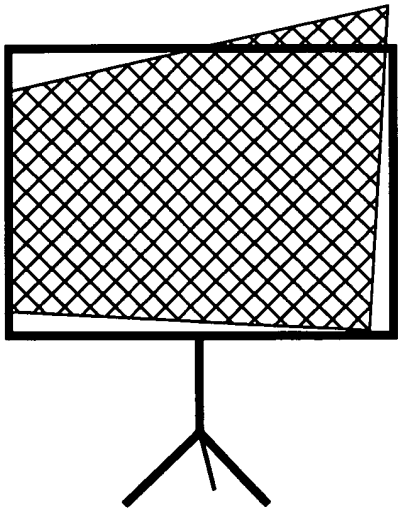


FIG. 23

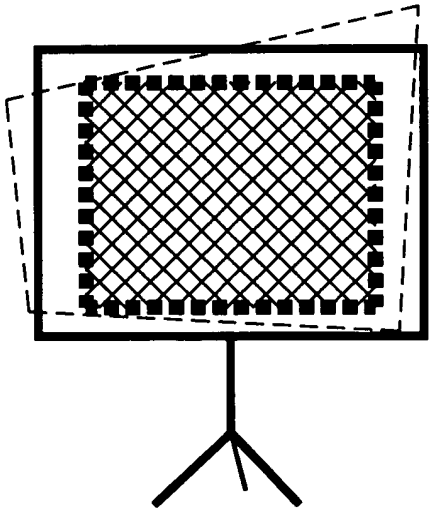


FIG. 24